5-A-11

Farnell

FARNELL INSTRUMENTS LTD.,
Sandbeck Way, Wetherby, Yorkshire.
Tel: OWE7 3541/6

MANUFACTURERS OF

TRANSISTORISED POWER SUPPLIES

ELECTRONIC INSTRUMENTS AND

INDUSTRIAL CONTROL SYSTEMS

INSTRUCTION MANUAL

FOR

STABILISED POWER SUPPLY

PS10A (F2123)

MF MASTER
MA23429

FARNELL INSTRUMENTS LIMITED

INSTRUCTION MANUAL

FOR

STABILISED POWER SUPPLY

PS10A (F2123)

FARNELL INSTRUMENTS LTD,
Sandbeck Way,Wetherby,Yorkshire.
Telephone Wetherby (OWE 7) 3541/2/3/4/5/6

C O N T E N T S

		Page No.
SECTION 1	INTRODUCTION	1
SECTION 11	OPERATION	2
SECTION 111	CIRCUIT DESCRIPTION	3
SECTION 1V	CIRCUIT DIAGRAM.	
ALSO:	DRAWING 3-2603, 3-5762. KEY TO CIRCUIT DIAGRAMS.	
	CIRCUIT DIAGRAM 3-2656. KEY TO CIRCUIT DIAGRAM.	
SECTION V	OUTLINE DRAWING AND SPECIFICATION.	
	COMPONENT LAYOUT.	

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_05855

SECTION 1

INTRODUCTION

This manual covers the power supply type PS10A.

The PS10A is a stabilised power supply unit which develops a D.C. output voltage. The semi-conductor complement of the supply is silicon throughout, permitting operation to 60°C at full specified output.

Output voltage is pre-set to a nominal voltage of 5 volts. Fine adjustment of ¼ volt above or below the pre-set voltage is given by a trimmer potentiometer (RV6).

Overload protection is provided by current limiting circuitry which reduces the output current on short circuit, but allows automatic voltage resetting when the overload is removed.

Cooling is by air convection so that provision should be made to allow air to flow freely into the bottom, and out of the top of the unit.

The instruments will accept mains inputs of 210, 220, 240, 105, 110, 115V and 120V 45 to 65 Hz. Mains input is applied via a flying lead, and the D.C. output is drawn from a painton multicon socket.

Mains input and D.C. output are well separated for safety reasons in respect of the user.

SECTION 1

INTRODUCTION

This manual covers the power supply type PS10A.

The PS10A is a stabilised power supply unit which develops 1 D.C. output voltage. The semi-conductor complement of the supply is silicon throughout, permitting operation to 80°C at full specified output.

Output voltage is pre-set to a nominal voltage of 5 volts. Fine adjustment of 1 volt above or below the pre-set voltage is given by a trimmer potentiometer (RV6).

Overload protection is provided by current limiting circuitry which reduces the output current on short circuit, but allows automatic voltage restoring when the overload is removed.

Cooling is by air convection so that provision should be made to allow air to flow freely into the bottom, and out of the top of the unit.

The instruments will accept mains inputs of 210, 230, 240, 101, 110, 115V and 120V at 65 Hz. Mains input is applied via a flying lead, and the D.C. output is drawn from a Belling multicon socket.

Mains input and D.C. output are well separated for safety reasons in respect of the user.

SECTION 11

OPERATION

Connection to the mains supply is via the three way input flying lead. Units are normally supplied for 240V operation, for other input voltages see the tap selector plate inside the unit.

D.C. output is taken from the painton socket upon the top of the unit. Feedback terminals are provided to correct for the voltage drop along the connecting leads. Connections should be made from the remote end of the negative lead to the connection FEEDBACK-and similarly from the remote end of the positive lead to the FEEDBACK + connection. Where feedback connections are not required, output and appropriate feedback terminals should be linked inside this painton plug.

The painton socket connections are as follows:

PIN 1 - + F/B.
PIN 2 - - F/B.
PIN 3 - + O/P.
PIN 4 - - O/P.

Each unit is pre-set to a voltage of 5 volts. Small adjustment of the output voltage is available by means of the O/P ADJUST trimmer potentiometer trimmer RV6. (see outline drawing).

Should the current limit point need adjustment, the C/L ADJUST potentiometer is available. This control is normally set approximately 10% in excess of the stated maximum operating current. Trimmer T2.

A crowbar voltage protection circuit is included, and its level is set to 5 volts + 10%. The level may be adjusted by means of P1a on the S200 board.

Access to T2 and P1a is gained by removing the six screws holding the cover.

SECTION 111

CIRCUIT DESCRIPTION

The circuit employs series regulator transistors driven via emitter followers from a two stage differential amplifier which compares the voltage of a zener diode reference with a proportion of the output voltage derived from a resistive potential divider. The reference and amplifier sections are mounted on a printed circuit board.

The mains supply is connected to transformer MT1 via the input connector lead. The main secondary windings supply a bridge rectifier, reservoir capacitor system which provides the main unregulated D.C. line. The positive line is connected via the series regulator transistors to the positive output terminal pin 3. The negative line is connected via fuse F1 to the negative output terminal, pin 4.

Supplies for the amplifier and reference section are derived from the auxiliary 36V secondary winding via rectifier diodes D1 and D2 and smoothed by capacitors C1 and C2. The unstabilised reference line across C1 and C2 is fed to zener diodes Z1 and Z2 through feed resistor R1. Z1 and Z2 provide a +10V -0- -10V supply for the differential amplifier. R2, Z3, VT1 and R4 comprise a constant current source to feed the main reference zener diode Z4, and potential divider chain R9, R10 and RV6.

The base of VT2, and the negative of Z4 are connected to the positive feedback terminal pin 1. Z4 therefore gives a voltage positive with respect to the positive output line. R9 is connected between the positive of Z4 and VT3 base. Signal voltage between VT2 and VT3 bases is amplified at their collectors, and applied to VT4 base. After amplification at VT4 collector the signal is applied to the emitter followers of the series regulator stage in such a sense as to oppose the original signal at VT2 and VT3 bases. The action of the loop is therefore to maintain zero signal between VT2 and VT3 bases. Output voltage is determined by:

$$\frac{\text{Vref.} \quad (\text{R10} + \text{RV6})}{\text{R9}}$$

Overload protection is provided by differential amplifiers VT6 and VT7. The base of VT6 is connected to the positive output terminal and the base of VT7 is connected to potential divider T2 and R18, connected between the series regulator emitter and the negative feedback terminal, Pin 2.

When output current is low VT7 is conducting since the voltage at its base is negative with respect to VT6 base, VT6 being cut off. As output current increases, the voltage across R23 increases and the junction of R23 and T2 becomes more positive, causing VT7 base to become more positive. With increasing load this process continues until the voltage between VT7 and VT6 bases approaches zero. At this point VT6 begins to conduct and VT7 to cut off. The voltage across R16 now begins to rise until D6 conducts and increases the drive at VT4 base. This increases the voltage across R13 and hence reduces the amount of drive available for the output regulator stages. At this point the output current limits and further increase in load causes the output voltage to fall. VT3 now cuts off, by the action of potential divider R9, R10 and RV6. Also as output voltage falls, the voltage at VT7 base becomes more positive by the action of potential divider T2, R18. This causes VT7 to conduct less and VT6 to conduct more. VT4 is now driven further into conduction and the voltage across R13 increases, thus reducing the drive available for the output regulator stages. In the absence of R19, this process would be regenerative, i.e. as soon as the limit point was reached, the output voltage would fall immediately to zero. R19 increases the slope of the output V/I characteristic in overload. With increasing overload the action of the circuitry is to reduce output current until at short circuit the current output is less than $\frac{1}{4}$ of the maximum output current. This ensures that the unit will reset into normal loads, once the overload is removed. The point at which initial current limit occurs is set by T2.

Overvoltage protection is provided by a separate crowbar circuit connected effectively across the units output terminals. The sensing of an over voltage is connected across the F/B terminals. The crowbar circuit is contained upon a separate circuit card, all components on the card being marked with a suffix a.

The card operation is as follows.

A differential amplifier VT1a, VT2a compare the voltage difference between a zener diode (Z1a) and a proportion of the output voltage derived from potentiometer chain R7a, P1a, and R6a.

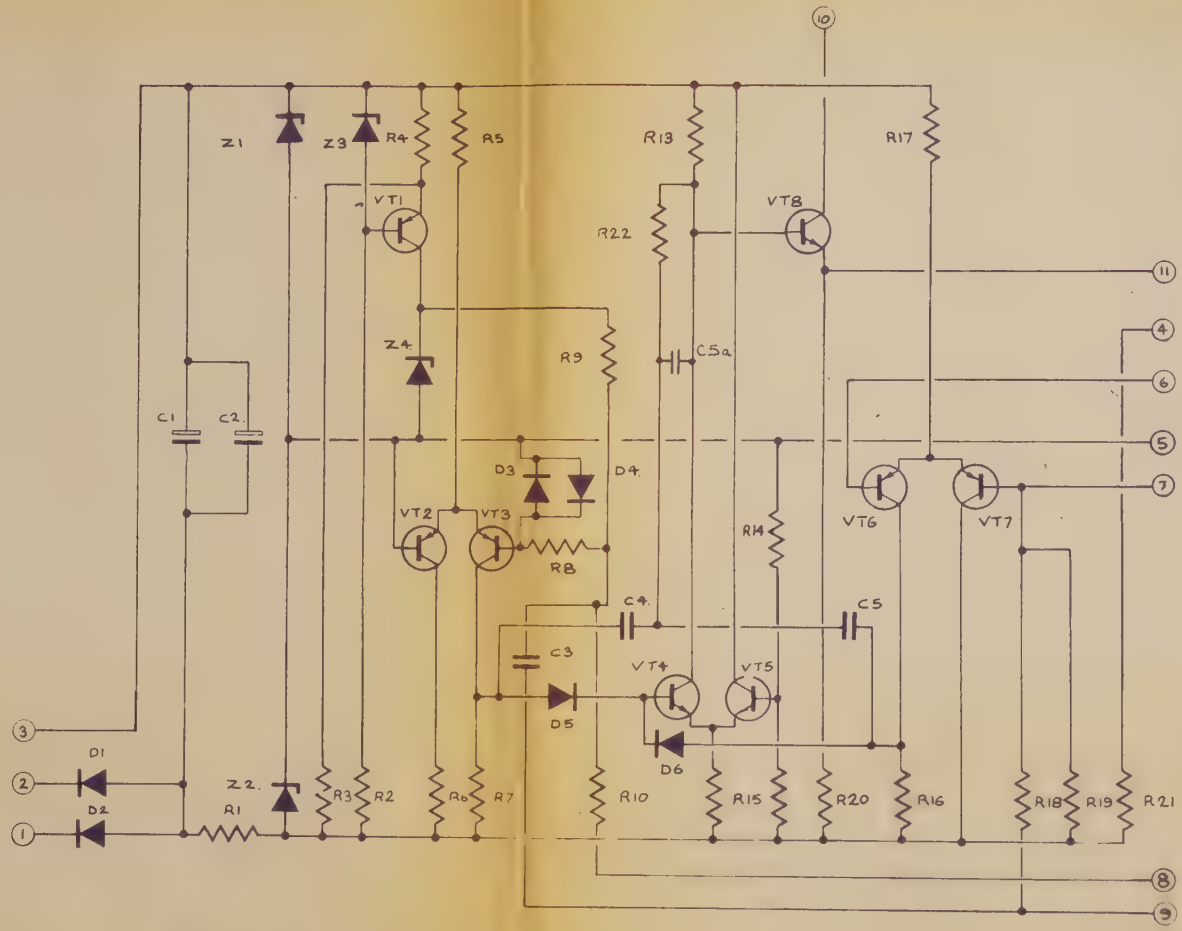
A regenerative feedback loop is connected from the output of the differential amplifier to the base of P1a via transistor VT3a. Under an over voltage condition VT2a conducts causing VT3a to conduct which in turn causes VT2a to further turn on. The action of the loop is to turn VT3a hard on, which in turn causes current to flow down potentiometer chain R9a, R10a. A voltage is presented to SCR1a cathode to gate by the drop across R9a, and hence the SCR conducts. The SCR prevents a short circuit across the output, and reduces the excess voltage condition.

The action of short circuiting the output is to either cause the current limit circuit to operate or to blow fuse F1.

USED ON

DRG. No 3-2603

R	1, 3, 2, 4, 6, 5, 7,	8, 10, 9, 22, 13, 15, 14, 20, 16, 17, 18, 19, 21.
C	1, 2,	3, 4, 5a, 5,
VT	1, 2, 3,	4, 5, 8, 6, 7,
MISC	D1, D2,	Z1, Z2, Z3, Z4, D3, D5, D4, D6,



TRACED					
CHECKED		3	7-5-69	563	
		2	29-3-69	539	
DRAWN	EMH.	ISS.	DATE	MOD. No.	
		1	4-11-68		

NOTE —
CAPACITOR VALUES GIVEN IN μF
RESISTOR VALUES IN Ω
(2) REFERS TO CCT. BD. PIN CONNECTION Nos.

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.

CIRCUIT DIAGRAM.
'S' SERIES. C.B.

DRAWING No. 2528
3-2603

USED ON	LOCATION	COMPONENT NUMBER	QUANTITY	VALUE	TOLERANCE	MANUFACTURER	MANUFACTURER'S TYPE No	MANUFACTURER'S RATING	OPERATIONAL RATING (MAX.)	REMARKS
		R1	1	680Ω	5%	WELWYN	F75	3W		
		R2	1	3·3K	"	ELECTROSIL	C5	½W		
		R3	1	33K	"	"	"	"		
		R4	1	330Ω	"	"	"	"		
		R5	1	4·7K	"	"	"	"		
		R6	1	5·6K	"	"	"	"		
		R7	1	5·6K	"	"	"	"		
		R8	1	47Ω	"	"	"	"		
		R9	1	2·2K	1%	WELWYN	4013	½W		
		R10	1	SOT	5%	ELECTROSIL	C5	½W		0-15RANGE
		R11								
		R12	1	1·5K	5%	ELECTROSIL	C5	½W		
		R13	1	4·7K	"	"	"	"		
		R14	1	1K	"	"	"	"		
		R15	1	1K	"	"	"	"		
	(3)	R16	1	3·3K	"	"	"	"		
		R17	1	4·7K	"	"	"	"		
		R18	1	SOT	"	"	"	"		
		R19	1	100K	"	"	"	"		
		R20	1	6·8K	"	"	"	"		
		R21	1	6·8K	"	"	"	"		
		R22	1	180Ω	"	"	"	"		
		C1	1	25μF		HUNTS	4575	50V		
		C2	1	25μF		"	"	50V		
		C3	1	4·7μF		SIEMENS	B32110	63V		
		C4	1	0·01μF		WIMA	TFM	160V		
		C5	1	0·01μF		WIMA	TFM	160V		
		C5a	1	750pF		ERIE	K1700SI/8NAM	500V		
		VT1	1			TEXAS	2N3702			
		VT2	1			"	"			
		VT3	1			"	"			
		VT4	1			STC(FOOTSCRAY)	BCY43			
		VT5	1			" "	"			
		VT6	1			TEXAS	2N3702			
		VT7	1			"	"			
		VT8	1			RCA.	2N3063			

D.A. CON.	COMPONENT NUMBER	QUANTITY	VALUE	TOLERANCE	MANUFACTURER	MANUFACTURER'S TYPE No	MANUFACTURER'S RATING	OPERATIONAL RATING MAX.	REMARKS
	D1	1			MULLARD	BYX36-300			
	D2	1			"	"			
	D3	1			TEXAS	IN659			
	D4	1			"	"			
	D5	1			"	"			
	D6	1			"	"			
	Z1	1			IRC	MZ10T5			
	Z2	1			IRC	"			
	Z3	1			STC(HARLOW)	ZF3·3			
	Z4	1			HUGHES.	HS2051			

TRACED							LOCATION KEY
CHECKED	3	30-6-69	585				
	2	29-1-69	539				
DRAWN	ISSUE	DATE	MOD No				SERIAL NUMBER / TESTED / DATE
EMH.	1	18-4-68					

FARNELL INSTRUMENTS LTD, WETHERBY, YORKS.

TITLE :— CIRCUIT DIAGRAM KEY 'S' SERIES CIRCUIT BOARD

DRAWING No. 3-2603/K

SHEET 1 OF 1 SHEETS

USED ON

DRG No. 3-5762

| | | |

USED ON	LOCATION	COMPONENT NUMBER	QUANTITY	VALUE	TOLERANCE	MANUFACTURER	MANUFACTURER'S TYPE No	MANUFACTURER'S RATING	OPERATIONAL RATING MAX	REMARKS
		R1	1	1K Ω		ELECTROSIL	MR5			
		R2	1	180 Ω		ELECTROSIL	MR5			
		R3	1	33 Ω		ELECTROSIL	MR5			
		R4	1	0·5 Ω		WELWYN	VPF1			OR SIMILAR
		R5	1	470 Ω		ELECTROSIL	MR5			
		R6	1	0·5 Ω		WELWYN	VPF1			OR SIMILAR
		R7	1	·2 Ω		ELECTROSIL	MR5			
		R8	1	12 Ω		ELECTROSIL	MR5			
		R9	1	0·5 Ω		WELWYN	VPF1			OR SIMILAR
		C		μF		W MA	TFM	160V		
		C2	1	15 + 2·2 μF		MULLARD	[illegible] 53	25 V		
		C3		2000 μF		MULLARD	C43/BR/F2000	25 V		
		C4	1	32 μF		MULLARD	C426AR/H32	64 V		
		VT1	1			RCA	2N3055			
		VT2	1			RCA	2N3055			
		VT3	1			RCA	2N3055			
		VT4	1			RCA	2N3055			
		T	1	1K		RELIANCE	CW52			
		T2	1	1K		RELIANCE	CW52			
		SCR1	1			IR	[illegible] RC2			
		MR1	1			IR	10B05T			

LOCATION	COMPONENT NUMBER	QUANTITY	VALUE	TOLERANCE	MANUFACTURER	MANUFACTURER'S TYPE No	MANUFACTURER'S RATING	OPERATIONAL RATING MAX	REMARKS
	F	1	T & A						
	MT				CUMBERNALD				SPEC F2123/TX1

TRACED

CHECKED

DRAWN PMR

ISSUE	DATE	MOD No
1	16.12.70	

LOCATION KEY

SERIAL NUMBER	TESTED	DATE

FARNELL INSTRUMENTS LTD, WETHERBY, YORKS.

TITLE :—
CIRCUIT DIAGRAM KEY
F2123

DRAWING No.
A·5763/K

SHEET . OF 1 SHEETS

USED ON

DRG. No. 3-2656

| | | |

DRAWING No. 3-2657

~~THIRD ANGLE PROJECTION~~

ALL ERRORS TO BE REPORTED TO THE DRAWING OFFICE

USED ON

VOLTS / COMP.	4-6v	6-9v	9-12v	12-15v	15-18v	18-21v	21-24v	24-27v	27-30v	30-34v	34-38v	38-42v	42-46v	46-50v	50-54v	54-58v	58-62v
R1a	330Ω	82Ω	560Ω	1KΩ	1·5KΩ	1·8KΩ	2·7KΩ	2·7KΩ	2·7KΩ	5·6KΩ	6·8KΩ	8·2KΩ	8·2KΩ	9·1KΩ	10KΩ	10KΩ	10KΩ
R2a	270Ω	270Ω	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ
R3a	470Ω	150Ω	1KΩ	1KΩ	1·5KΩ	2KΩ	2·7KΩ	3·3KΩ	4·7KΩ	5·6KΩ	6·8KΩ	6·8KΩ	8·2KΩ	8·2KΩ	9·1KΩ	10KΩ	10KΩ
R4a	470Ω	150Ω	1KΩ	1KΩ	1·5KΩ	2KΩ	2·7KΩ	3·3KΩ	4·7KΩ	5·6KΩ	6·8KΩ	6·8KΩ	8·2KΩ	8·2KΩ	9·1KΩ	10KΩ	10KΩ
R5a	680Ω	680Ω	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ
R6a	270Ω	680Ω	1·5KΩ	1·5KΩ	1·5KΩ	1·5KΩ	1·5KΩ	1·5KΩ	1·5KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ
R7a	33Ω	100Ω	1·2KΩ	1·5KΩ	3·3KΩ	4·7KΩ	5KΩ	5·6KΩ	6·8KΩ	6·8KΩ	8·2KΩ	8·2KΩ	10KΩ	12KΩ	12KΩ	15KΩ	15KΩ
R8a	1KΩ	10K	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ	10KΩ
R9a	100Ω	270Ω	270Ω	540Ω	680Ω	680Ω	1KΩ	1KΩ	1·5KΩ	1·5KΩ	1·5KΩ	1·8KΩ	2KΩ	2·2KΩ	2·4KΩ	2·7KΩ	2·7KΩ
R10a	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ
R11a	ON UNITS UP TO 1A OUTPUT, FIT 2x0·5Ω W21 IN PARALLEL — ABOVE 1A R11a IS DELETED OPEN CIRCUIT																
P1a	220Ω	220Ω	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ	1KΩ
VT1a	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053
VT2a	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053	2N3053
VT3a	2CY31	2CY31	2CY31	2CY31	2CY31	2CY31	2CY31	2CY31	2CY31	ZTX504	ZTX504	ZTX504	ZTX504	ZTX504	ZTX504	ZTX504	ZTX504
Z1a	ZF3·3	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051	HS2051

R9a*	47Ω	120Ω	180Ω	220Ω	270Ω	330Ω	390Ω	470Ω	560Ω	560Ω	680Ω	680Ω	820Ω	910Ω	1KΩ	1KΩ	1·2KΩ

1. ALL RESISTORS MR5 OR MR30 EXCEPT WHERE STATED

2. LINK "o/v"

3. R9a IN MAIN TABLE FOR 20 mA GATE CURRENT, FOR ALL TO-5 AND PLASTIC CAN S.C.R.s — R9a* FOR 50 mA GATE CURRENT FOR ALL OTHER S.C.R.s

4. POTENTIOMETERS ARE PLESSEY W.M.P.

	ISS.	DATE	MOD. No.
TRACED			
CHECKED	4	15-6-71	923
	3	12-1-70	716
	2	4-12-69	689
DRAWN J.D.M.	1	23-7-69	—

TOLERANCES

MATERIAL

SCALE

PROTECTIVE FINISH

DIMENSIONS IN MM

NOTE: REMOVE ALL BURRS AND SHARP EDGES

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.

TITLE: S200 OVER-VOLTAGE COMPONENT LIST

DRAWING No. 3-2657

SHEET 1 OF 1 SHEETS

DRAWING No. 2-5911

USED ON

THIRD ANGLE PROJECTION

ALL ERRORS TO BE REPORTED TO THE DRAWING OFFICE

COVER 3-5643 - NOT SHOWN, SCREENED TO DWG 2-5910

RECTIFIER 10BOST MOUNTED AS SHOWN WITH 2 BA C'SK HD SCREWS 1 3/8" LG

TRANSFORMER SECURED TO BASE WITH BRACKETS 4-5646 WHICH MUST BE FITTED TO TRANS FIRST

2 HEATSINKS 3-5654 WITH 2 REGULATORS ON LOWER ONE AND REG + DRIVER ABOVE

BASE PLATE 2-5638 - ALL MOUNTING SCREWS UNDERNEATH TO BE C'SK. SCREEN TO DWG 2-5909

FUSE PANEL 3-5641 WITH FUSE HOLDER L5196 AND 4 PIN SOCKET FITTED. SCREWS FOR PANEL TO BE INST HD. SCREEN TO DWG 2-5909.

HEARING SUPPORT 4-5645 TO BE USED WITH SECURING STRIP 4-5676. USE MEA HD SCREWS.

+5v UNIT AND

END PLATE 3-5640 WITH SCR EXT 4-5647 & 3/4 DIA CAP CLIP FITTED. USE INST HD SCREWS.

CIRCUIT BD A1934 C SUPPORTED FROM BASE ON 6FA SPACERS.

2" CAP CLIP TYPE S490.

RESERVOIR CAP 15,000 25V

DANGER

5.0.100.110.120 | 5.0.100.110.120

BROWN Y'R BLUE

RV6

T2

SCR TYPE 22 RC5 MOUNTED ON EXT & OUTPUT CAP 2,000-10V FITTED IN CLIP.

SIDE PLATE 3-5639

S200 CCT BOARD A2207 WITH COMPONENTS TO SUIT 4-6V. SEE DWG 3-2057

NAME PLATE 4-5908 SECURED WITH SPACERS 4FG & SCREENED TO DWG 2-5909

TERMINAL STRIP 10 WAY SUPPORTED ON 4 SPACERS TYPE 6FG. TO BE WIRED TO TRANSFORMER AS PER INFO ON NAME PLATE.

MAINS CABLE FITTED THRO CABLE CLAMP SKSP4 WITH EARTH WIRE SOLDERED TO TAG FIXED TO BASE PLATE. FREE LENGTH TO OUTSIDE 4".

CIRCUIT BD A1912 WITH 2 POTS CW52-1K. WIRE POTS AS SHOWN. SUPPORT BOARD ON SPACERS TYPE 6FA

CIRCUIT BD PLATE 4-5644. MOUNT CIRCUIT BOARDS AND HARWIN BKS BEFORE ASSY

TRACED						
CHECKED						
DRAWN EWJ	ISSUE	DATE	MOD. No.			
	1	17-3-71	—			

For Material List See ML 5648 Sheet 1 & 2

TOLERANCES	PROTECTIVE FINISH	NOTE: REMOVE ALL BURRS AND SHARP EDGES
MATERIAL		
SCALE: FULL SIZE	DIMENSIONS IN M.M.	

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.

TITLE: F 2123 G.A.

DRAWING No. 2-5911

SHEET 1 OF 1 SHEETS

MP MASTER
MA23429